Abstract Submitted
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Velocity kinematic relations in a turbulent flow past a grid ALEX LIBERZON, Tel-Aviv U., ROI GURKA, Ben-Gurion U., GREGORY KOPP, PARTHA SARATHI, U. Western Ontario, ARKADY TSINOBER, Tel-Aviv U. — We present velocity kinematic relations, involving average and difference of the longitudinal velocity component of the two points at distance r: $u_+ = u(x+r) + u(x)$ and $u_- = u(x+r) - u(x)$, obtained using PIV measurements in a turbulent flow of water past a grid. The present study follows recent numerical and experimental studies, that demonstrated analytical and empirical evidence of the relations, their validity and it emphasizes the physical meaning of the relations. The relations that contain both the large (u_+) and small (u_-) scale quantities emphasize the non-local aspects of turbulent flows. For example, the pure kinematic relation of Hosokawa in conjunction with the the Kolmogorov 4/5 law leading to the $\langle u_+^2 u_- \rangle = \langle \epsilon \rangle r/30$ shows that the that the large and small scale quantities are correlated contrary to what is suggested by the commonly used sweeping decorrelation hypothesis. Some relations are purely kinematic and some are dynamic, i.e. involving $\langle \varepsilon \rangle$, like the Kolmogorov 4/5 law. The most important aspect is that pure kinematic relations that emphasize the non-local effects, become dynamically significant. Furthermore, we suggest that many of these relations could be used for validation of experimental results.

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